

Application No. 09/683,659
Reply to Office Action of April 13, 2005

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-128 (cancelled)

Claim 129. (New) An apparatus, comprising:

a first capsule that comprises a closed end structure, a wall, and a sealable end structure, and which defines a chamber, wherein

the wall adjoins the closed end and extends therefrom; and

the sealable end structure adjoins the wall opposite the closed end structure, and the chamber is configured to receive a material and a solvent, and the solvent is capable of becoming supercritical at a predetermined temperature to provide a predetermined pressure in the chamber; and

a second capsule that comprises a closed end structure, a wall, and a sealable end structure, the second capsule comprising a malleable metal and being operable to deform in response to the predetermined pressure, and the first capsule being disposed within the second capsule.

Claim 130. (New) The apparatus as defined in claim 129, wherein the first capsule comprises one or more of copper, gold, silver, palladium, platinum, iridium, ruthenium, rhodium, osmium, iron, nickel, titanium, vanadium, chromium, zirconium, niobium, molybdenum, tantalum, tungsten, or rhenium.

Claim 131. (New) The apparatus as defined in claim 129, wherein the second capsule comprises one or more of copper, gold, silver, palladium, platinum, iridium,

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ruthenium, rhodium, osmium, iron, nickel, titanium, vanadium, chromium, zirconium, niobium, molybdenum, tantalum, tungsten, or rhenium.

Claim 132. (New) The apparatus as defined in claim 131, wherein the second capsule comprises one or more of copper-based alloy, iron-based alloy, or nickel-based alloy.

Claim 133. (New) The apparatus as defined in claim 129, wherein the first capsule comprises fused silica.

Claim 134. (New) The apparatus as defined in claim 129, wherein the first capsule comprises quartz glass.

Claim 135. (New) The apparatus as defined in claim 129, wherein the first capsule comprises one or more of borosilicate glass, aluminosilicate glass, soda lime glass, soda barium glass, soda zinc glass, lead glass, potash soda lead glass, potash lead glass, or potash soda barium glass.

Claim 136. (New) The apparatus as defined in claim 129, further comprising a pressure medium disposed within the second capsule and outside of the first capsule.

Claim 137. (New) The apparatus as defined in claim 136, wherein the pressure medium comprises one or more of water, carbon dioxide, or ammonia.

Claim 138. (New) The apparatus as defined in claim 129, wherein the first capsule comprises a lid, and the lid is operable to sealingly engage the sealable end structure.

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Claim 139. (New) The apparatus as defined in claim 138, wherein the lid has a first pipe thread, and the sealable end structure has a second pipe thread configured to engage the first pipe thread, and the lid is sealable to the wall at the sealable end structure by a pipe thread seal.

Claim 140. (New) The apparatus as defined in claim 138, further comprising a compression fitting, and wherein the lid is sealable to the wall at the sealable end structure by a metal-to-metal compression seal formed by the compression fitting.

Claim 141. (New) The apparatus as defined in claim 138, further comprising a gasket, and wherein the lid is sealable to the wall at the sealable end structure by a gasket seal formed by the gasket.

Claim 142. (New) The apparatus as defined in claim 138, wherein the lid is sealable to the wall by a weld seal.

Claim 143. (New) The apparatus as defined in claim 142, wherein the lid is cold-weldable.

Claim 144. (New) The apparatus as defined in claim 142, wherein lid is hot-weldable.

Claim 145. (New) The apparatus as defined in claim 144, wherein the lid is operable to be welded by one or more of torch welding, arc welding, ultrasound welding, or vibratory welding.

Claim 146. (New) The apparatus as defined in claim 138, wherein the lid comprises one or more of copper, gold, silver, palladium, platinum, iridium, ruthenium,

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rhodium, osmium, titanium, vanadium, chromium, iron, nickel, zirconium, niobium, molybdenum, tantalum, tungsten, rhenium, silicon, or aluminum.

Claim 147. (New) The apparatus as defined in claim 129, further comprising a coating disposed on an inner surface of the first capsule, and the coating comprises one or more of nickel, rhodium, gold, silver, palladium, platinum, ruthenium, iridium, tantalum, tungsten, or rhenium, and the coating and the first capsule are formed from different compositions.

Claim 148. (New) The apparatus as defined in claim 147, wherein the coating has a thickness in a range of from about 0.5 micron to about 250 microns.

Claim 149. (New) The apparatus as defined in claim 129, further comprising a liner disposed on an inner surface of the first capsule.

Claim 150. (New) The apparatus as defined in claim 149, wherein the liner has a thickness in a range of from about 10 microns to about 5 millimeters.

Claim 151. (New) The apparatus as defined in claim 149, further comprising a diffusion barrier disposed within the first capsule between the liner and the first capsule inner surface.

Claim 152. (New) The apparatus as defined in claim 129, wherein each of the wall, the closed end structure, and said sealable end structure has a thickness in a range of from about 0.2 millimeters to about 10 millimeters.

Claim 153. (New) The apparatus as defined in claim 129, further comprising a baffle, wherein the chamber is divided into two regions by the baffle.

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Claim 154. (New) The apparatus as defined in claim 153, wherein the baffle has a fractional open area in a range of from about 0.5% to about 30%.

Claim 155. (New) The apparatus as defined in claim 129, further comprising an outer seal joined to the sealable end structure and entirely surrounding the first capsule.

Claim 156. (New) An article comprising the apparatus as defined in claim 129, wherein the sealable end structure is sealed such that the first capsule is impermeable to at least one supercritical fluid.

Claim 157. (New) An apparatus, comprising:

a deformable capsule that comprises a closed end structure, a wall, and a sealable end structure, and which defines a chamber configured to receive a material and a solvent, wherein

the wall adjoins the closed end and extends therefrom, and the sealable end structure adjoins the wall opposite the closed end structure, and

the solvent is capable of becoming supercritical at a predetermined temperature to provide a predetermined pressure in the chamber, and the predetermined pressure is greater than about 5 kbar and is sufficient to deform the capsule, wherein

the sealable end structure is operable to seal the chamber such that the capsule is impermeable to supercritical solvent at the predetermined temperature and predetermined pressure; and

a zero-stroke pressure device configured to receive the capsule and operable to counterbalance the predetermined pressure generated within the chamber by the supercritical solvent at the predetermined temperature.

Claim 158. (New) The apparatus as defined in claim 157, wherein the zero-

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stroke pressure device is operable to only counterbalance the predetermined pressure.

Claim 159. (New) The apparatus as defined in claim 157, wherein the predetermined temperature is at least about 550 degrees Celsius.

Claim 160. (New) The apparatus as defined in claim 157, wherein the capsule comprises one or more of copper, gold, silver, palladium, platinum, iridium, ruthenium, rhodium, osmium, iron, nickel, titanium, vanadium, chromium, zirconium, niobium, molybdenum, tantalum, tungsten, or rhenium.

Claim 161. (New) The apparatus as defined in claim 157, wherein the capsule comprises one or more of copper-based alloy, iron-based alloy, or nickel-based alloy.

Claim 162. (New) The apparatus as defined in claim 157, wherein the capsule comprises a lid, and the lid is operable to sealingly engage the sealable end structure.

Claim 163. (New) The apparatus as defined in claim 162, wherein the lid has a first pipe thread, and the sealable end structure has a second pipe thread configured to engage the first pipe thread, and the lid is sealable to the wall at the sealable end structure by a pipe thread seal.

Claim 164. (New) The apparatus as defined in claim 162, further comprising a compression fitting, and wherein the lid is sealable to the wall at the sealable end structure by a metal-to-metal compression seal formed by the compression fitting.

Claim 165. (New) The apparatus as defined in claim 162, further comprising a gasket, and wherein the lid is sealable to the wall at the sealable end structure by a gasket seal formed by the gasket.

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Claim 166. (New) The apparatus as defined in claim 162, wherein the lid is sealable to the wall by a weld seal.

Claim 167. (New) The apparatus as defined in claim 162, wherein the lid is cold-weldable.

Claim 168. (New) The apparatus as defined in claim 162, wherein lid is hot-weldable.

Claim 169. (New) The apparatus as defined in claim 168, wherein the lid is operable to be welded by one or more of torch welding, arc welding, ultrasound welding, or vibratory welding.

Claim 170. (New) The apparatus as defined in claim 162, wherein the lid comprises one or more of copper, gold, silver, palladium, platinum, iridium, ruthenium, rhodium, osmium, titanium, vanadium, chromium, iron, nickel, zirconium, niobium, molybdenum, tantalum, tungsten, rhenium, silicon, or aluminum.

Claim 171. (New) The apparatus as defined in claim 170, wherein the lid comprises a fill tube, and the fill tube comprise at least one of copper, copper-based alloy, gold, silver, palladium, platinum, iridium, ruthenium, rhodium, osmium, titanium, vanadium, chromium, iron, iron-based alloy, nickel-based alloy, zirconium, niobium, molybdenum, tantalum, tungsten, rhenium, silica, alumina, or combinations thereof.

Claim 172. (New) The apparatus as defined in claim 171, wherein the fill tube is cold-weldable.

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Claim 173. (New) The apparatus as defined in claim 157, further comprising a coating disposed on an inner surface of the capsule, and the coating comprises one or more of nickel, rhodium, gold, silver, palladium, platinum, ruthenium, iridium, tantalum, tungsten, or rhenium, and the coating and the first capsule are formed from different compositions.

Claim 174. (New) The apparatus as defined in claim 173, wherein the coating has a thickness in a range of from about 0.5 micron to about 250 microns.

Claim 175. (New) The apparatus as defined in claim 157, further comprising a liner disposed on an inner surface of the capsule.

Claim 176. (New) The apparatus as defined in claim 175, wherein the liner has a thickness in a range of from about 10 microns to about 5 millimeters.

Claim 177. (New) The apparatus as defined in claim 175, further comprising a diffusion barrier disposed within the capsule between the liner and the capsule inner surface.

Claim 178. (New) The apparatus as defined in claim 157, wherein each of the wall, the closed end structure, and the sealable end structure has a thickness in a range of from about 0.2 millimeters to about 10 millimeters.

Claim 179. (New) The apparatus as defined in claim 157, further comprising a baffle, wherein the chamber is divided into two regions by the baffle.

Claim 180. (New) The apparatus as defined in claim 179, wherein the baffle has a fractional open area in a range of from about 0.5% to about 30%.

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Claim 181. (New) An apparatus, comprising:

a first capsule that comprises a closed end structure, a wall, and a sealable end structure, and which defines a chamber, wherein

the wall adjoins the closed end and extends therefrom; and

the sealable end structure adjoins the wall opposite the closed end structure, and the chamber is configured to receive a material and a solvent, and the solvent is capable of becoming supercritical at a predetermined temperature to provide a predetermined pressure in the chamber; and

a second capsule comprising a malleable metal and being operable to deform in response to the predetermined pressure, and the first capsule being disposed within the second capsule; and

a zero-stroke pressure device configured to receive the second capsule and operable only to counterbalance the predetermined pressure generated within the chamber by the supercritical solvent at the predetermined temperature.

Claim 182. (New) The apparatus as defined in claim 181, wherein the first capsule or the second capsule comprises one or more of copper, gold, silver, palladium, platinum, iridium, ruthenium, rhodium, osmium, iron, nickel, titanium, vanadium, chromium, zirconium, niobium, molybdenum, tantalum, tungsten, or rhenium.

Claim 183. (New) The apparatus as defined in claim 181, wherein the first capsule comprises fused silica.

Claim 184. (New) The apparatus as defined in claim 181, wherein the first capsule comprises quartz glass.

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Claim 185. (New) The apparatus as defined in claim 181, wherein the first capsule comprises one or more of borosilicate glass, aluminosilicate glass, soda lime glass, soda barium glass, soda zinc glass, lead glass, potash soda lead glass, potash lead glass, or potash soda barium glass.

Claim 186. (New) The apparatus as defined in claim 181, further comprising a pressure medium disposed within the second capsule and outside of the first capsule.

Claim 187. (New) The apparatus as defined in claim 186, wherein the pressure medium comprises one or more of water, carbon dioxide, or ammonia.

Claim 188. (New) The apparatus as defined in claim 181, wherein the first capsule comprises a lid, and the lid is operable to sealingly engage the sealable end structure.

Claim 189. (New) The apparatus as defined in claim 188, wherein the lid has a first pipe thread, and the sealable end structure has a second pipe thread configured to engage the first pipe thread, and the lid is sealable to the wall at the sealable end structure by a pipe thread seal.

Claim 190. (New) The apparatus as defined in claim 188, further comprising a compression fitting, and wherein the lid is sealable to the wall at the sealable end structure by a metal-to-metal compression seal formed by the compression fitting.

Claim 191. (New) The apparatus as defined in claim 188, further comprising a gasket, and wherein the lid is sealable to the wall at the sealable end structure by a gasket seal formed by the gasket.

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Claim 192. (New) The apparatus as defined in claim 188, wherein the lid is sealable to the wall by a weld seal.

Claim 193. (New) The apparatus as defined in claim 192, wherein the lid is cold-weldable.

Claim 194. (New) The apparatus as defined in claim 192, wherein lid is hot-weldable.

Claim 195. (New) The apparatus as defined in claim 194, wherein the lid is operable to be welded by one or more of torch welding, arc welding, ultrasound welding, or vibratory welding.

Claim 196. (New) The apparatus as defined in claim 188, wherein the lid comprises one or more of copper, gold, silver, palladium, platinum, iridium, ruthenium, rhodium, osmium, titanium, vanadium, chromium, iron, nickel, zirconium, niobium, molybdenum, tantalum, tungsten, rhenium, silicon, or aluminum.

Claim 197. (New) The apparatus as defined in claim 196, wherein the lid comprises a fill tube, and the fill tube comprise at least one of copper, copper-based alloy, gold, silver, palladium, platinum, iridium, ruthenium, rhodium, osmium, titanium, vanadium, chromium, iron, iron-based alloy, nickel-based alloy, zirconium, niobium, molybdenum, tantalum, tungsten, rhenium, silica, alumina, or combinations thereof.

Claim 198. (New) The apparatus as defined in claim 181, further comprising a coating disposed on an inner surface of the first capsule, and the coating comprises one or more of nickel, rhodium, gold, silver, palladium, platinum, ruthenium, iridium, tantalum, tungsten, or rhenium, and the coating and the first capsule are formed from different

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compositions.

Claim 199. (New) The apparatus as defined in claim 198, wherein the coating has a thickness in a range of from about 0.5 micron to about 250 microns.

Claim 200. (New) The apparatus as defined in claim 181, further comprising a liner disposed on an inner surface of the first capsule.

Claim 201. (New) The apparatus as defined in claim 200, wherein the liner has a thickness in a range of from about 10 microns to about 5 millimeters.

Claim 202. (New) The apparatus as defined in claim 200, further comprising a diffusion barrier disposed within the first capsule between the liner and the first capsule inner surface.

Claim 203. (New) The apparatus as defined in claim 181, wherein each of the wall, the closed end structure, and said sealable end structure has a thickness in a range of from about 0.2 millimeters to about 10 millimeters.

Claim 204. (New) The apparatus as defined in claim 181, further comprising a baffle, wherein the chamber is divided into two regions by the baffle.

Claim 205. (New) The apparatus as defined in claim 204, wherein the baffle has a fractional open area in a range of from about 0.5% to about 30%.

Claim 206. (New) An article comprising the apparatus as defined in claim 181, wherein the sealable end structure is sealed such that the first capsule is impermeable to at least one supercritical fluid.